

NONPROVISIONAL PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Attorney Docket No.: 104018

Date: August 10, 1999

BOX PATENT APPLICATION

**NONPROVISIONAL APPLICATION TRANSMITTAL
 RULE §1.53(b)**

Assistant Commissioner for Patents
 Washington, D.C. 20231

Sir:

Transmitted herewith for filing under 37 C.F.R. §1.53(b) is the nonprovisional patent application

For (Title): PNEUMATIC RADIAL TIRES

By (Inventors): Yuichiro OGAWA

- ☒ Formal drawings (Figs. 1-9; 9 sheets) are attached.
- ☒ A Declaration and Power of Attorney is filed herewith.
- ☒ An assignment of the invention to BRIDGESTONE CORPORATION is filed herewith.
- ☒ An Information Disclosure Statement is filed herewith.
- ☐ A statement to establish small entity status under 37 C.F.R. §§1.9 and 1.27 is filed herewith.
- ☐ A Preliminary Amendment is filed herewith.
- ☐ Please amend the specification by inserting before the first line the sentence --This nonprovisional application claims the benefit of U.S. Provisional Application No. _____, filed _____--
- ☒ Priority of foreign application(s) No. 10-246820 filed September 1, 1998 in Japan is claimed (35 U.S.C. §119).
- ☐ A certified copy of the above corresponding foreign application(s) is filed herewith.
- ☒ The filing fee is calculated below:

**CLAIMS IN THE APPLICATION AFTER ENTRY OF
 ANY PRELIMINARY AMENDMENT NOTED ABOVE**

FOR:	NO. FILED	NO. EXTRA
BASIC FEE		
TOTAL CLAIMS	9 - 20	= 0*
INDEP CLAIMS	1 - 3	= 0*
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIMS PRESENTED		

* If the difference is less than zero, enter "0".

SMALL ENTITY	
RATE	FEE
	\$ 380
x 9 =	\$
x 39 =	\$
+130 =	\$
TOTAL	\$

OR
OR
OR
OR
OR
OR

OTHER THAN A SMALL ENTITY	
RATE	FEE
	\$ 760
x 18	\$
x 78	\$
+260	\$
TOTAL	\$ 760

- ☒ Check No. 102204 in the amount of \$760 to cover the filing fee is attached. Except as otherwise noted herein, the Commissioner is hereby authorized to charge any other fees that may be required to complete this filing, or to credit any overpayment, to Deposit Account No. 15-0461. Two duplicate copies of this sheet are attached.
- ☐ This application is entitled to small entity status. DO NOT charge large entity fees to our Deposit Account.

Respectfully submitted,

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Application Information

Title Line One:: PNEUMATIC RADIAL TIRES
Title Line Two::
Title Line Three::
Title Line Four :
Total Drawing Sheets:: 9
Docket Number:: 104018

Continuity Information

>This application is a::
Application One::
Filing Date::
Patent Number::
which is a::
>>Application Two::
Filing Date::
Patent Number::

Prior Foreign Applications

Foreign Application One:: 10-246820
Filing Date:: September 1, 1998
Country:: Japan
Priority Claimed:: Yes
Foreign Application Two::
Filing Date::
Country::
Priority Claimed::
Foreign Application Three::
Filing Date::
Country::
Priority Claimed::

PNEUMATIC RADIAL TIRES

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a pneumatic radial tire, and more particularly to a pneumatic radial tire wherein a carcass ply cord is a continuous
5 cord successively repeating roundtrip between a pair of bead portions in a circumferential direction of the tire. Particularly, the invention relates to a pneumatic radial tire capable of conducting automatic building in the production of an uncured tire and having an excellent bead portion durability.

2. Description of Related Art

10 In the carcass ply of the general-purpose pneumatic radial tire, it is well-known that organic fiber cords such as nylon cord, polyester cord and the like or inorganic fiber cords such as carbon fiber cord, steel cord and the like are used as a reinforcing member for a pair of bead portions, a pair of sidewall portions and a tread portion.

15 The carcass ply comprised of a radial arrangement of the above cords has a turnup portion wound around a bead core embedded in the bead portion from an inside of the tire toward an outside thereof, wherein cut ends of the cords are located in an upper end of the turnup portion. During the running of the tire having such a radial carcass ply under loading, a large shearing strain is
20 applied to the cord cut end of the turnup portion and hence the upper end part of the turnup portion results in the occurrence of separation failure.

On the other hand, the tire having the above carcass ply structure requires man power in the building of an uncured tire, which is out of the trend for labor saving and power saving and obstructs the building automation toward
25 a near future.

At present, there are proposed pneumatic radial tires having a carcass

ply structure suitable for automatic building wherein cut ends of the cords are not formed in the upper end of the turnup portion, or tire production methods suitable for automatic building. For example, JP-A-6-171306 proposes a carcass fixing method wherein a cord of a radial carcass ply is a round trip
5 arrangement of a continuous cord extending between a pair of bead portions and a return portion of the round trip cord is interposed from both sides thereof in an axial direction of the tire between a pair of bead cores through hard rubber layers having a Shore A hardness of not less than 70.

And also, JP-A-9-155991 is concerned with the same method of
10 producing a pneumatic radial tire as in the above publication in a point that the cord of the radial carcass ply is a round trip arrangement of a continuous cord extending between a pair of bead portions, but proposes a method wherein a return portion of a round trip cord is wound each bead core between a pair of bead cores from an inside of the tire toward an outside thereof in the radial
15 direction likewise the conventional tire and the bead core is constructed with cords as well as a tire manufactured by this method.

According to the methods proposed by the above two publications, the automatic building is certainly facilitated, and the resulting pneumatic tires are superior to the conventional tire in a point that cut ends of the carcass ply
20 cords are not existent in the bead portion.

In the pneumatic tire proposed in the former publication, however, since the return portion of the round trip cord is merely anchored in the bead core through the hard rubber, a phenomenon of pulling out the carcass ply cord from the bead core is caused as the running of the tire proceeds under an
25 inflation of an internal pressure and hence a sufficient bead portion durability can not be obtained.

On the other hand, in the pneumatic tire proposed in the latter publication, the roundtrip return portion of the carcass ply cord forms a turnup

portion around the bead core, so that the above inconvenience of the former publication may be improved to a certain extent, but since the bead core is constructed with the cords or twisted wires and a single bead core is used in each bead portion, the elongation is large along a circumference of the bead portion
5 and the bead portion stiffness is lack and hence the development of the phenomenon of pulling out the carcass ply cord is accompanied and there is still left a problem that the bead portion durability is lacking.

SUMMARY OF THE INVENTION

It is, therefore, an object of the invention to provide a pneumatic
10 radial tire having a carcass structure capable of easily conducting automatic building of an uncured tire, and controlling a pulling-out phenomenon of a carcass ply cord and sufficiently ensuring a strength and rigidity required for a bead portion to provide an excellent bead portion durability.

According to the invention, there is the provision of a pneumatic
15 radial tire comprising a radial carcass extending between a pair of bead portions each including two bead cores therein and reinforcing a pair of sidewall portions and a tread portion, wherein the radial carcass is comprised of a rubberized ply of a continuous cord successively repeating round trip in at least one of the two bead cores as a pair between the pair of the bead portions along a circumference
20 of the bead portion and a roundtrip return portion of the cord is existent in both the bead portions, characterized in that at least one of the two bead cores has such a structure that one or more steel wires are arranged lengthwise and widthwise in radial and widthwise directions of the tire, and the cord of the carcass ply has a roundtrip return portion located through a side face of the bead
25 core having the above structure so as to cover at least an innermost steel wire arrangement in the radial direction from an inner side in the radial direction of the tire.

In a preferable embodiment of the invention, the two bead cores in

each bead portion are arranged adjacent to each other in a widthwise direction of the tire and the roundtrip return portion of the carcass ply cord is sandwiched between the two bead cores. In this case, it is favorable that the roundtrip return portion of the carcass ply cord extends from an inside of the tire toward
5 an outside thereof in the widthwise direction along an inner circumference of the innermost steel wire arrangement of the bead core in the radial direction.

In another preferable embodiment of the invention, the roundtrip return portion of the carcass ply cord has a terminal part extending along an outer side face of a bead core located outside in the widthwise direction of the
10 tire.

In the other preferable embodiment of the invention, the roundtrip return portion of the carcass ply cord extends from an outside of the tire toward an inside thereof in the widthwise direction of the tire along an inner circumference of the innermost steel wire arrangement of the bead core.

In a further preferable embodiment of the invention, the two bead
15 cores in each bead portion are arranged adjacent to each other and a bead core of the two bead cores located at an inside of the tire has the above innermost steel wire arrangement and the roundtrip return portion of the carcass ply cord extends along an inner side face of such a bead core. In this case, it is
20 favorable that the roundtrip return portion of the carcass ply cord has a terminal part wound around the bead core having the innermost steel wire arrangement from an inside of the tire toward an outside thereon in the radial direction.

In a still further preferable embodiment of the invention, the roundtrip return portion of the carcass ply cord has a single terminal part aligned
25 at a given pitch along the circumference of the bead portion or multiple terminal parts overlapped with each other at a given pitch along the circumference of the bead portion.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described with reference to the accompanying drawings, wherein:

Fig. 1 is a diagrammatically section view of a first embodiment of the pneumatic radial tire according to the invention;

Fig. 2 is a side view of a main part seen through from a direction of an arrow A in Fig. 1;

Figs. 3 to 8 are diagrammatically section views of first to sixth embodiments of the bead portion according to the invention; and

Fig. 9 is a side view of a main part in another embodiment of the pneumatic radial tire according to the invention.

DESCRIPTION OF PREFERRED EMBODIMENTS

In Fig. 1 is shown a first embodiment of the pneumatic radial tire according to the invention, which comprises a pair of bead portions 1, a pair of sidewall portions 2, a tread portion 3 connecting the sidewall portions 2, and a radial carcass 5 extending between the pair of the bead portions 1 including two bead cores 4 therein and reinforcing the bead portions 1, sidewall portions 2 and tread portion 3. A belt 6 reinforcing the tread portion 3 is disposed on an outer circumference of the radial carcass 5 according to the custom. The two bead cores 4 are inner bead core 4i and outer bead core 4o arranged adjacent to each other in the widthwise direction of the tire. In Fig. 1, symbol e is an equatorial plane of the tire.

The radial carcass 5 is comprised of one or more rubberized plies having a radial cord arrangement (one ply in the illustrated embodiment). As shown in Fig. 2, a ply cord 5C of the radial carcass 5 is one or more continuous cords (one cord in the embodiment of Fig. 2), for example, an inorganic continuous fiber cord such as steel cord or the like, or an organic continuous fiber cord such as polyester cord, nylon cord, rayon cord or the like.

In this case, the continuous cord successively repeats round trip in at least one of the two bead cores 4 as a pair (between the bead cores 4i, 4o in the illustrated embodiment) along a circumference of the bead portion 1, and a terminal part of the ply cord 5C of the carcass 5 is arranged so as to cover at least an inside of either one of the two bead cores 4i, 4o in the bead portion 1 in the radial direction of the tire.

In Fig. 2 is shown a side view illustrating the ply cord 5C of the carcass 5 and the bead core 4 (outer bead core 4o) seen through from a direction of an arrow A in Fig. 1, wherein when a ply cord located at a certain position along the circumference of the bead portion 1 is $5C_1$, a part of the ply cord 5C on and after a ply cord $5C_n$ at n-th position is illustrated. The ply cord $5C_n$ extends from a bead core 4 (not shown) of one of the bead portions 1 to a bead core 4 (outer bead core 4o in the illustrated embodiment) of the other bead portion 1 and is returned at the position of the bead core 4o (side face position at the outside of the tire in the embodiment of Fig. 2) at a given interval in an extending direction of the bead core 4o and extends toward the bead core (not shown) of the bead portion 1 as a ply cord $5C_{n+1}$. The ply cord $5C_{n+1}$ is returned at the bead core 4 (not shown) of the bead portion 1 in the same manner as mentioned above and again extends toward the side face position of the outer bead core 4o of the bead portion as a ply cord $5C_{n+2}$. The ply cord $5C_{n+2}$ is again returned at this position and extends toward the bead core 4 (not shown) as a ply cord $5C_{n+3}$. Such a round trip is successively repeated in the circumferential direction of the tire to form the ply cord 5C of the carcass 5 over a full circumference of the tire. Symbol E shown in Fig. 2 is a return end.

Thus, each of the bead portions 1 has roundtrip return portions 5Cu of the ply cord 5C of the carcass 5 (see Figs. 3-8). Moreover, the roundtrip return portion 5Cu means a portion of the ply cord 5C ranging from a position adjacent to the bead core 4 (4i or 4o) up to the return end E in the turning from

forward path to backward path.

At least one of the two bead cores 4i, 4o, more concretely a bead core covered with the ply cord 5C of the carcass 5 from an inside in the radial direction of the tire is formed so as to have such a structure that a single steel wire Sw is arranged lengthwise and widthwise in radial and widthwise directions of the tire plural times as shown in Figs. 3-8. That is, the ply cord 5C of the carcass 5 has a return portion 5Cu located through a side face of the bead core having the lengthwise and widthwise arranged structure of the single steel wire Sw so as to cover at least steel wire Sw group in an innermost steel wire arrangement of the bead core in the radial direction from the inner side in the radial direction of the tire.

Each of Figs. 3-8 shows an example that each of the two bead cores 4i, 4o has the lengthwise and widthwise arranged structure of the single steel wire Sw. Such a lengthwise and widthwise arranged structure of the single steel wire Sw in each of the bead cores 4i, 4o is formed by helically winding a single continuous steel wire Sw at a given row number (2 rows in each of the figures) side by side, and then helically winding at a given row number (2 rows in each of the figures) side by side thereon and repeating such a helical winding to form a given stage number (4 stages in each of the figures). Moreover, a plurality of single continuous steel wires Sw may be used, if necessary. In the formation of the bead core 4i, 4o, when the single steel wire Sw is required to have a tackiness, it is favorable that a very thin uncured rubber film is formed on the single steel wire Sw. As the single steel wire Sw, a piano wire having a circular section is suitable, a diameter of which is preferably within a range of 0.75-2.25 mm.

In case of a tubeless tire, a taper of a given angle is given to a bead base Bb of the tire (see Figs. 3-8) and a rubber margin having a given size corresponding to a taper bead seat of an approved rim (a rim described in 1998

JATMA YEAR BOOK) is applied thereto so as to provide a function as a tubeless tire. As a result, the ply cord 5C of the carcass 5 covering the inside of at least one of the two bead cores in the radial direction of the tire as mentioned above is strongly sandwiched between the bead seat of the approved rim and the
5 bead core 4i or 4o having the lengthwise and widthwise arranged structure of the single steel wire Sw, so that the ply cord 5C of the carcass 5 can sufficiently withstand to a pulling-out force applied from the bead core 4 (4i, 4o) to the ply cord 5C under an inflation of an internal pressure during the running under loading.

10 Therefore, the invention is most suitable for the tubeless tire.

Since the ply cord 5C of the carcass 5 has a roundtrip return portions in the circumferential direction of the bead portion as mentioned above, the ply member of the carcass 5 can be formed on a building drum in the building of an uncured tire, and hence the automatic building becomes naturally easy.

15 In Figs. 3-8, the ply cord 5C of the carcass 5 is mainly shown and a coating rubber 5g for the ply cord 5C is partly shown. It is needless to say that the coating rubber 5g completely cover the ply cord 5C from the illustrated position to the return end E. Various embodiments on the roundtrip return portion 5Cu will be described more concretely with reference to Figs. 3-8 below.

20 In the embodiment of Fig. 3, the bead portion 1 of the tire has a structure that the roundtrip return portion 5Cu of the ply cord 5C passed between the outer bead core 4o and the inner bead core 4i covers a group of steel wires Sw in an innermost steel wire arrangement of the outer bead core 4o in the radial direction of the tire and the return end E is stopped in a covering region.

25 Fig 4 is a modified embodiment of Fig. 3, wherein the return end E of the roundtrip return portion 5Cu is extended up to a halfway of an outer side face of the outer bead core 4o. That is, the roundtrip return portion forms a turnup portion wound around the outer bead core 4o from an inside of the tire

toward an outside thereof in the radial direction. Fig. 5 is a modified embodiment of Fig. 4, wherein the return end E of the roundtrip return portion 5Cu is extended outward over the outer bead core 4o in the radial direction of the tire.

The embodiment of Fig. 6 is different from the embodiments of Figs. 3-5, wherein the bead portion 1 of the tire has a structure that the roundtrip return portion 5Cu of the ply cord 5C passed between the outer bead core 4o and the inner bead core 4i covers a group of steel wires Sw in an innermost steel wire arrangement of the inner bead core 4i in the radial direction of the tire and the return end E is stopped in a covering region.

In all embodiments of Figs. 3-6, the roundtrip return portion 5Cu is sandwiched between the inner bead core 4i and the outer bead core 4o in the bead portion 1.

In the embodiments of Figs. 7 and 8, the bead portion 1 of the tire has such a structure that the ply cord 5C is extended along an inner side face of an inner bead core 4i and wound around the inner bead core 4i from an inside of the tire toward an outside thereof in the radial direction to form a roundtrip return portion 5Cu, and the roundtrip return portion 5Cu is sandwiched between the inner bead core 4i and the outer bead core 4o. In Fig. 7, the return end E of the roundtrip return portion 5Cu is located between the inner bead core 4i and the outer bead core 4o. In Fig. 8, the return end E of the roundtrip return portion 5Cu is extended outward over the inner and outer bead cores 4i, 4o in the radial direction of the tire.

In the carcass 5 shown in Fig. 2, the roundtrip return portion 5Cu of the ply cord 5C has a single terminal part aligned at a given pitch along the circumference of the bead portion 1. On the other hand, in the ply cord 5C of the carcass 5 shown in Fig. 9, the roundtrip return portion 5Cu forms double terminal parts overlapped with each other at a given pitch along the circumference of the bead portion 1. In the latter case, a ply cord 5C_m as a forward

path is disposed between the ply cord $5C_n$ as a forward path and the ply cord $5C_{n+1}$ as a backward path and returned at the same given pitch as mentioned above to form a ply cord $5C_{m+1}$. The ply cord $5C_n$, $5C_{n+1}$ crosses with the ply cord $5C_m$, $5C_{m+1}$ in the vicinity of the return end E of the roundtrip return portion 5Cu. Although the double terminal parts are shown in Fig. 9, multi terminal parts may be formed. Moreover, the ply cord 5C having the multi terminal parts can be made by using a single continuous cord or by using two or more continuous cords.

Either or both of the inner bead core 4i and outer bead core 4o is not necessarily made of a single bead core and may be made of two or more bead cores.

The following examples are given in illustration of the invention and are not intended as limitations thereof.

There are provided three radial tires for passenger cars having a tire size of 195/65R14 and a structure shown in Fig. 1, wherein a carcass 5 is comprised of one cord ply containing polyester cords of 1500 D/2 therein as Examples 1-3. The bead portion 1 of the tire has a roundtrip return portion 5Cu of the ply cord 5C shown in Fig. 3 in Example 1, in Fig. 4 in Example 2, and in Fig. 5 in Example 3, respectively. A single steel wire Sw constituting a bead core 4 (comprised of inner bead core 4i and outer bead core 4o) is a piano wire having a diameter of 0.96 mm. For a comparison, a conventional tire has the same structure as in the tires of Examples 1-3 except that the return end E of the roundtrip return portion 5Cu is located between the inner bead core 4i and the outer bead core 4o.

With respect to the tires of Examples 1-3 and the conventional example, a test for bead portion durability is carried out under a condition of causing troubles in the bead portion. When the durability is represented by an index on the basis that the conventional example is 100, the index values of the

durability in Examples 1-3 are 110~114 (the larger the index value, the better the durability). Moreover, the trouble caused in the conventional example results from the pulling-out of the carcass ply cord, while the trouble caused in Examples 1-3 results from the breakage of the ply cord 5C in the carcass 5.

- 5 As mentioned above, according to the invention, the phenomenon of pulling out the carcass ply cord can be controlled while maintaining the carcass structure facilitating automatic building of an uncured tire. Therefore, the invention can provide a pneumatic radial tire capable of largely improving the bead portion durability by the above controlling effect.

99101 (10-246,820)

What is claimed is:

1. A pneumatic radial tire comprising a radial carcass extending between a pair of bead portions each including two bead cores therein and reinforcing a pair of sidewall portions and a tread portion, wherein the radial carcass is comprised of a rubberized ply of a continuous cord successively repeating round trip in at least one of the two bead cores as a pair between the pair of the bead portions along a circumference of the bead portion and a roundtrip return portion of the cord is existent in both the bead portions, characterized in that at least one of the two bead cores has such a structure that one or more steel wires are arranged lengthwise and widthwise in radial and widthwise directions of the tire, and the cord of the carcass ply has a roundtrip return portion located through a side face of the bead core having the above structure so as to cover at least an innermost steel wire arrangement in the radial direction from an inner side in the radial direction of the tire.

2. A pneumatic radial tire according to claim 1, wherein the two bead cores in each bead portion are arranged adjacent to each other in a widthwise direction of the tire and the roundtrip return portion of the carcass ply cord is sandwiched between the two bead cores.

3. A pneumatic radial tire according to claim 2, wherein the roundtrip return portion of the carcass ply cord extends from an inside of the tire toward an outside thereof in the widthwise direction along an inner circumference of the innermost steel wire arrangement of the bead core in the radial direction.

4. A pneumatic radial tire according to claim 1, wherein the roundtrip return portion of the carcass ply cord has a terminal part extending along an outer side face of a bead core located outside in the widthwise direction of the tire.

5. A pneumatic radial tire according to claim 2, wherein the roundtrip return portion of the carcass ply cord extends from an outside of the tire toward

an inside thereof in the widthwise direction of the tire along an inner circumference of the innermost steel wire arrangement of the bead core.

6. A pneumatic radial tire according to claim 1, wherein the two bead cores in each bead portion are arranged adjacent to each other and a bead core of the two bead cores located at an inside of the tire has the above innermost steel wire arrangement and the roundtrip return portion of the carcass ply cord extends along an inner side face of such a bead core.

7. A pneumatic radial tire according to claim 6, wherein the roundtrip return portion of the carcass ply cord has a terminal part wound around the bead core having the innermost steel wire arrangement from an inside of the tire toward an outside thereon in the radial direction.

8. A pneumatic radial tire according to claim 1, wherein the roundtrip return portion of the carcass ply cord has a single terminal part aligned at a given pitch along the circumference of the bead portion.

9. A pneumatic radial tire according to claim 1, wherein the roundtrip return portion of the carcass ply cord has multiple terminal parts overlapped with each other at a given pitch along the circumference of the bead portion.

ABSTRACT OF THE DISCLOSURE

A pneumatic radial tire comprises a radial carcass extending between a pair of bead portions each including two bead cores therein and reinforcing a pair of sidewall portions and a tread portion, wherein the radial carcass is comprised of a rubberized ply of a continuous cord successively repeating round trip in at least one of the two bead cores as a pair between the pair of the bead portions along a circumference of the bead portion and a roundtrip return portion of the cord is existent in both the bead portions. In this case, at least one of the two bead cores has such a structure that one or more steel wires are arranged lengthwise and widthwise in radial and widthwise directions of the tire, and the cord of the carcass ply has a roundtrip return portion located through a side face of the bead core having the above structure so as to cover at least an innermost steel wire arrangement in the radial direction from an inner side in the radial direction of the tire.

FIG. 1

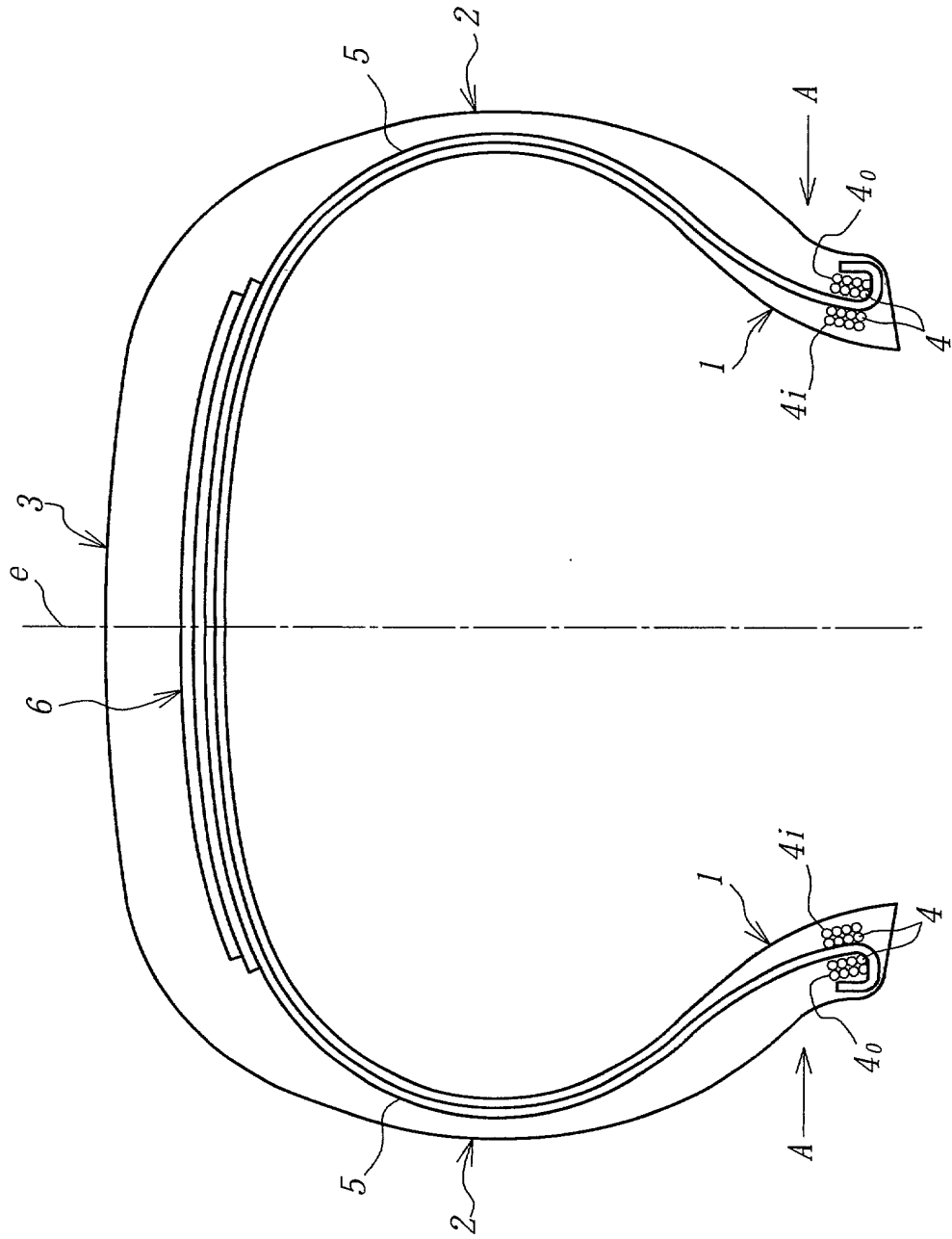


FIG. 2

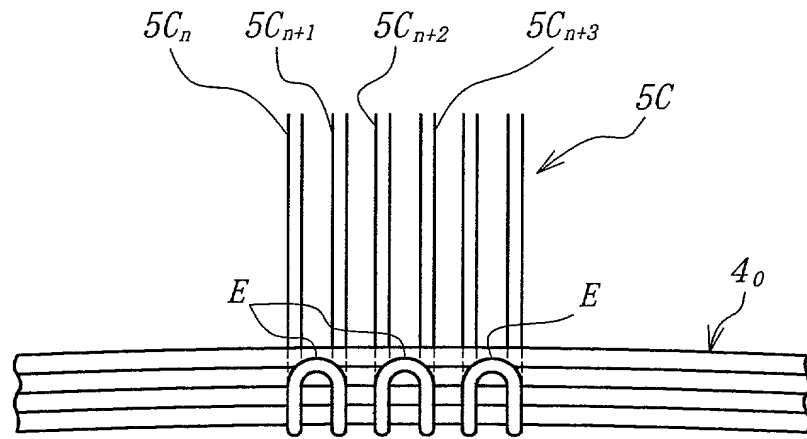


FIG. 3

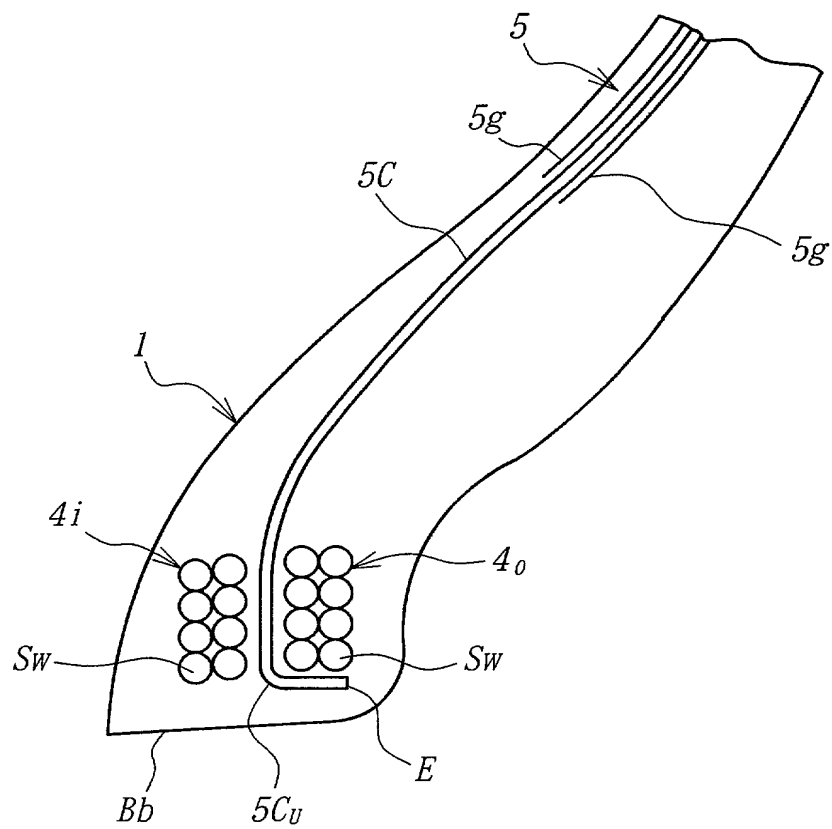


FIG. 4

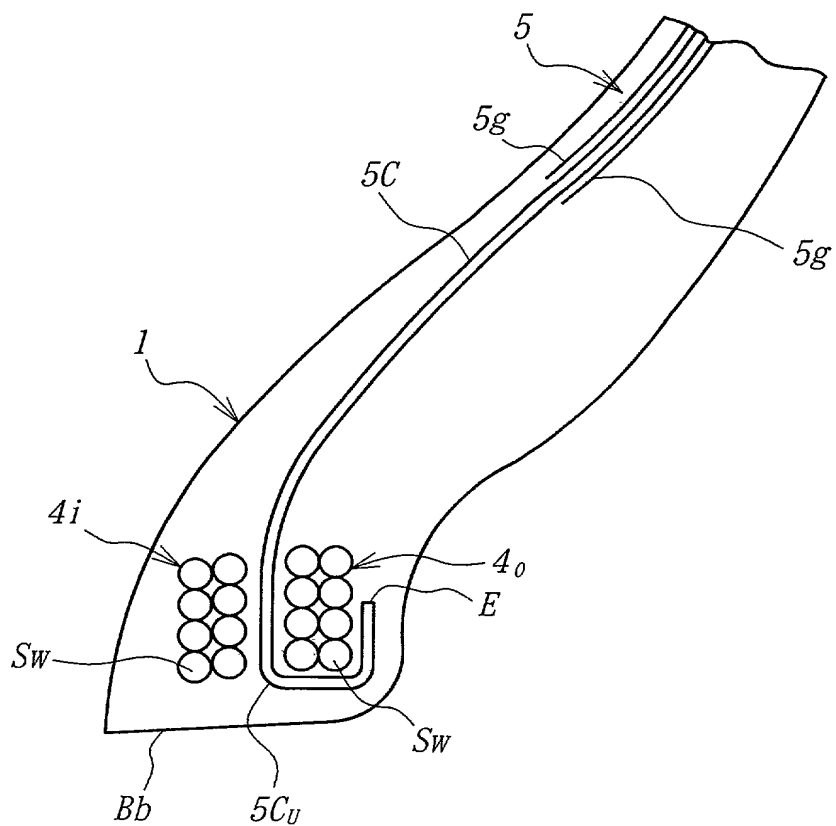


FIG. 5

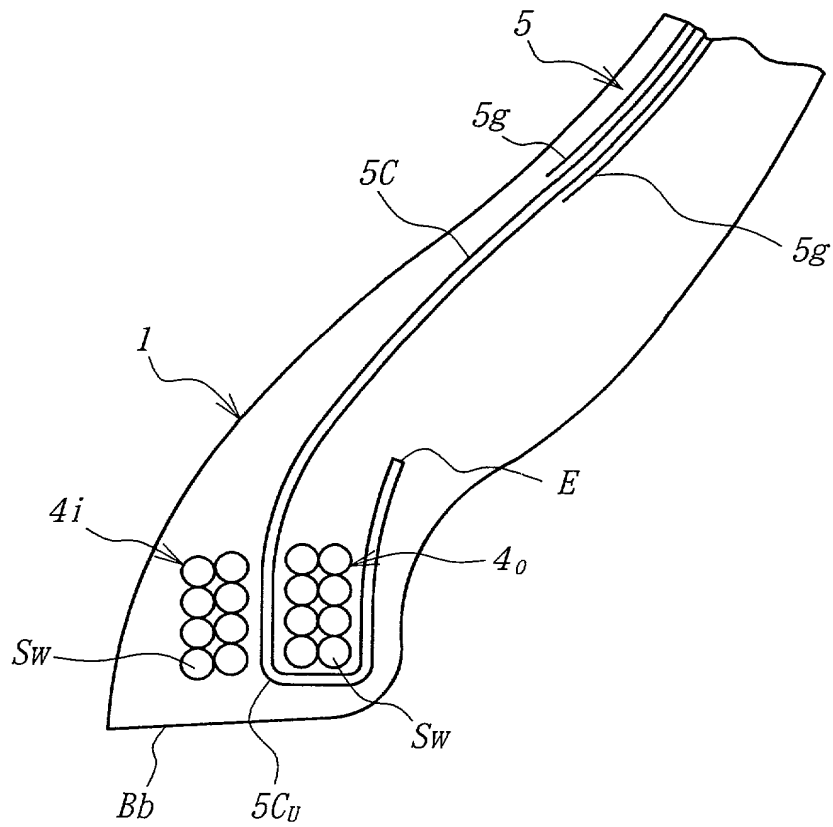


FIG. 6

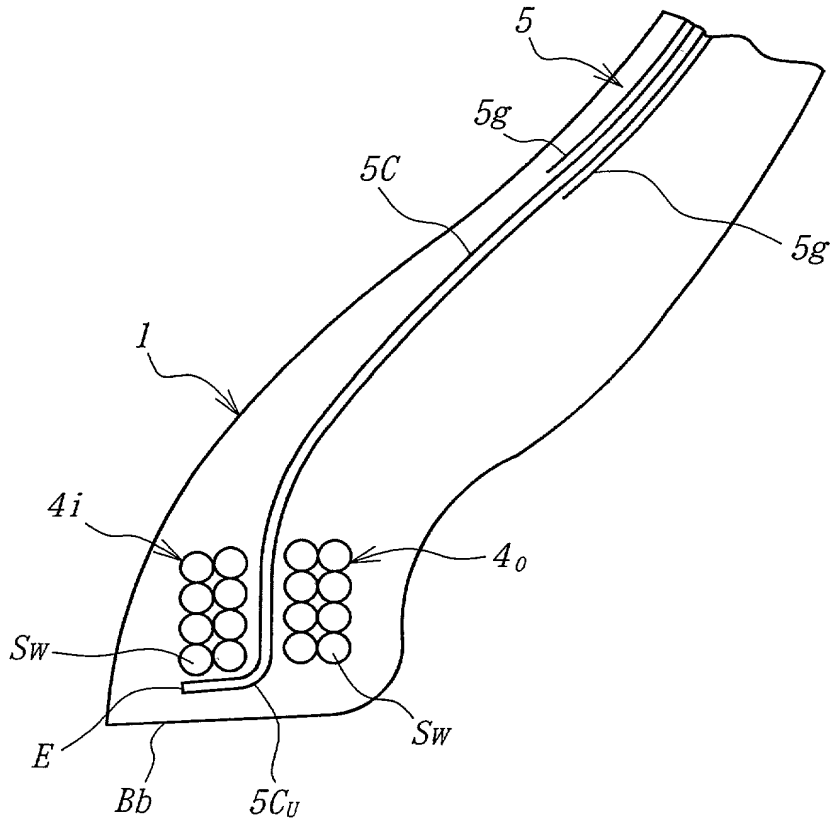


FIG. 7

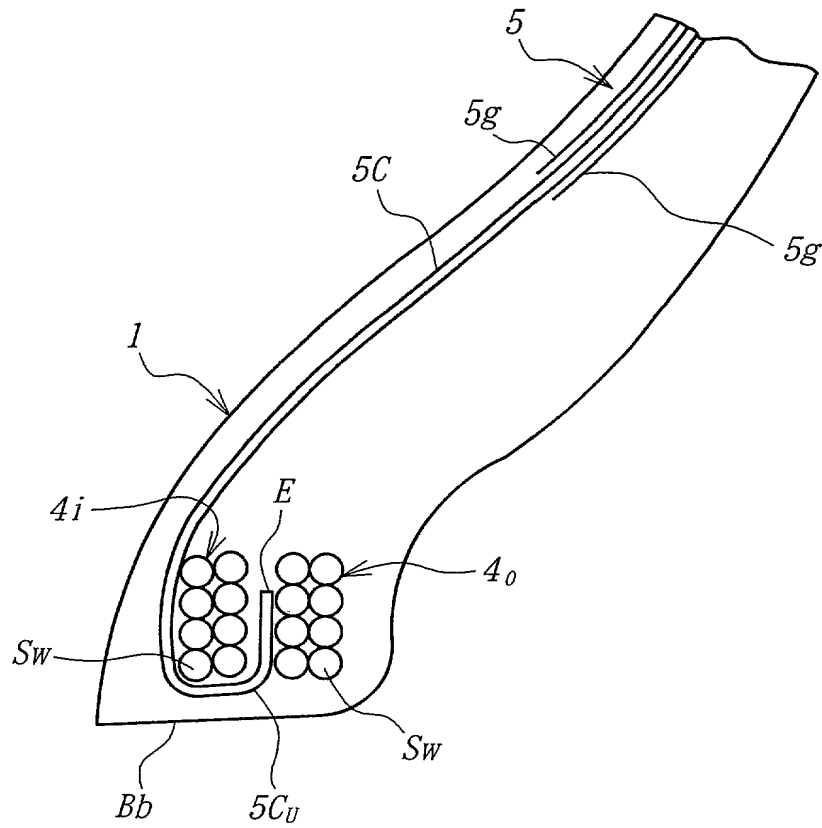


FIG. 8

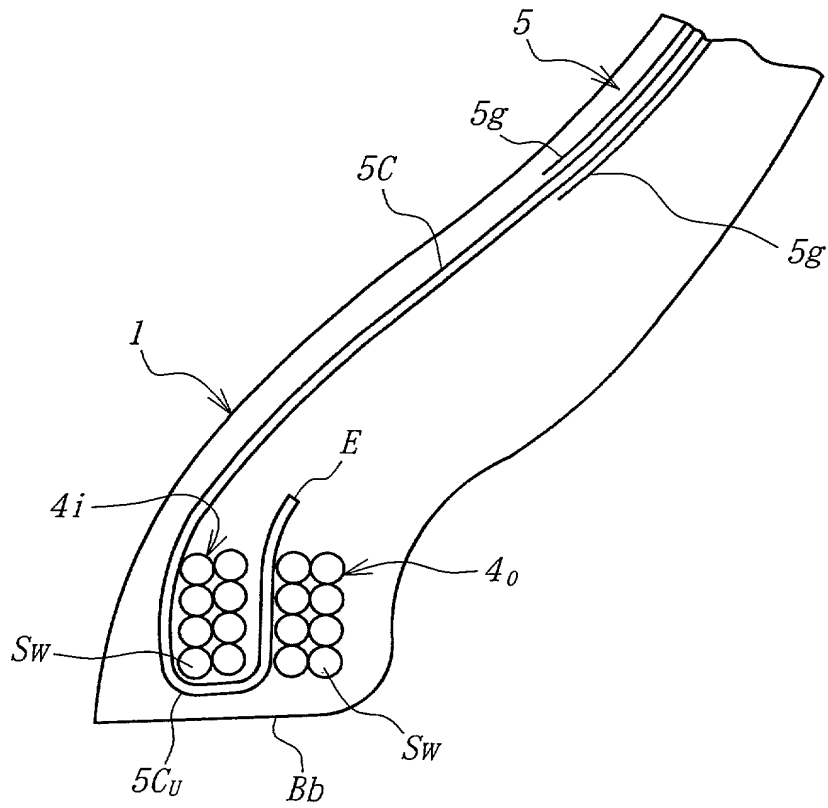
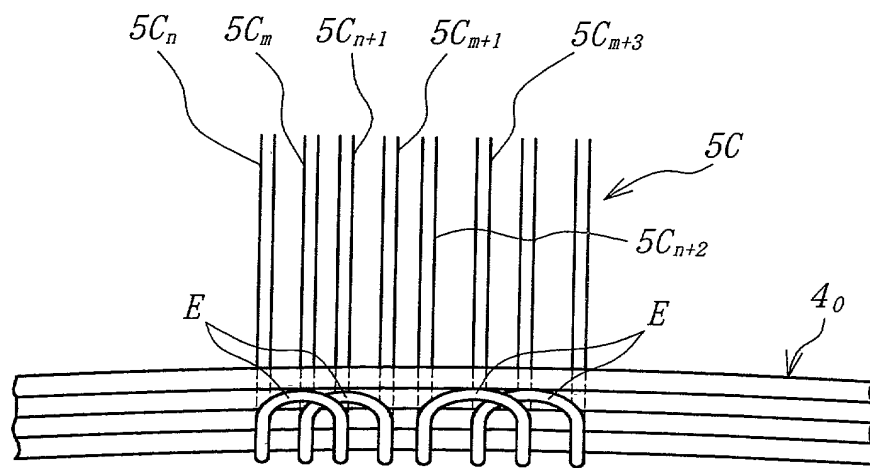


FIG. 9



APPLICATION FOR UNITED STATES PATENT DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name; that

I verily believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: PNEUMATIC RADIAL TIRES

described and claimed in the specification:

Check one

- *a. ☒ attached hereto
b. ☐ filed on _____ as Application No. _____ and amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

Under Title 35, U.S. Code §119, the priority benefits of the following foreign application(s) and/or United States provisional application(s) filed within one year prior to this application are hereby claimed:

Japanese Patent Application No. 10-246,820 filed September 1, 1998

The following application(s) for patent or inventor's certificate on this invention were filed in countries foreign to the United States of America either (a) more than one year prior to this application, or (b) before the filing date of the above-named foreign priority application(s) and/or United States provisional application(s):

I hereby appoint the following as my attorneys of record with full power of substitution and revocation to prosecute this application and to transact all business in the Patent Office:

James A. Oliff, Reg. No. 27,075; William P. Berridge, Reg. No. 30,024;
Kirk M. Hudson, Reg. No. 27,562; Thomas J. Pardini, Reg. No. 30,411;
Edward P. Walker, Reg. No. 31,450; Robert A. Miller, Reg. No. 32,771;
Mario A. Costantino, Reg. No. 33,565; and Caroline D. Dennison, Reg. No. 34,494.

ALL CORRESPONDENCE IN CONNECTION WITH THIS APPLICATION SHOULD BE SENT TO OLIFF & BERRIDGE, PLC, P.O. BOX 19928, ALEXANDRIA, VIRGINIA 22320, TELEPHONE (703) 836-6400.

I hereby declare that I have reviewed and understand the contents of this Declaration, and that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

1	Typewritten Full Name of First or Sole Inventor	<u>Yuichiro</u>			<u>OGAWA</u>
		Given Name	Middle Initial	Family Name	
2	**Inventor's Signature:	<u>Yuichiro</u>			<u>OGAWA</u>
3	**Date of Signature:	<u>August 6, 1999</u>			
		Month	Day	Year	
	Residence:	<u>Fuchu City, Tokyo, Japan</u>			
		City	State or Province	Country	
	Citizenship:	<u>Japanese</u>			
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*If Box (a.) is checked, this form may be executed only when attached to the specification (including claims).

**Note to Inventor: Please sign name exactly as it appears above and insert actual date of signing.

IF THERE IS MORE THAN ONE INVENTOR USE PAGE 2 AND PLACE AN "X" HERE ☐